

Adaptable Multi-Segment Altitude Control (AM-SAC) Balloon for Planetary Exploration, Phase I Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)



ABSTRACT

Thin Red Line USA (TRL-USA) proposes a unique, multi-segment balloon with low-power, rapid mobility altitude control cycling capability that is applicable to both Venus and Titan atmospheric exploration missions as well as other planetary bodies. The innovation creates a single architecture that allows reliable, low power, virtually unlimited altitude cycling capability; overcoming the pitfalls of all other known options for lighter-than-atmosphere exploration at both Venus and Titan. The Phase I effort lays a strong foundation for a Phase II effort that will include the construction and demonstration of an at-scale system using materials suitable for a Venus or Titan mission. The proposed innovation and following Phase II work can, in just 2 years, enable a viable Venus or Titan exploration mission with a low risk LTA system.

ANTICIPATED BENEFITS

To NASA funded missions:

Potential NASA Commercial Applications: The Thin Red Line USA proposed innovation enables NASA to conduct long duration atmospheric observations at both Venus and Titan with payloads >100kg with a new, low power, highly reliable, long life, lighter-than-atmosphere architecture that can be customized for multiple planetary missions with extensive non-recurring-engineering. The proposed balloon technology has immediate application in the exploration of atmospheric planets and moons. This technology improves upon the platform objectives of the Venus Climate Mission (VCM), one of five flagship missions called for by the National Research Council 2013 Decadal Survey. The VCM mission includes a gondola/balloon system with a 21 day life at a 55.5km altitude in 2021. Its objectives are to characterize the greenhouse atmosphere of Venus, its origin and evidence of climate change. This mission can be significantly enhanced by staying aloft for five or more years and navigate the planet utilizing altitude cycling. To meet a 2021

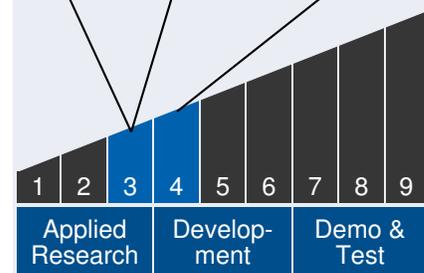


Table of Contents

Abstract	1
Anticipated Benefits	1
Technology Maturity	1
Management Team	1
U.S. Work Locations and Key Partners	3
Image Gallery	4
Details for Technology 1	4

Technology Maturity

Start: 3 | Current: 3 | Estimated End: 4



Management Team

Program Executives:

- Joseph Grant
- Laguduva Kubendran

Program Manager:

- Carlos Torrez

Continued on following page.

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launch, preliminary design and technology completion for the VCM must occur in 2017-18 and can incorporate proposed innovation. The technology could also play a vital role in the Titan Saturn Mission which is expected to have a balloon-navigated sensor platform that operates in conjunction with an orbiter and lake-lander.

To the commercial space industry:

Potential Non-NASA Commercial Applications: The Thin Red Line USA (TRL-USA) proposed innovation advances a technology with significant terrestrial applications. The robust TRL-USA multi-segment altitude control balloon can provide rapid mobility altitude cycling capability, long life, and recoverability to many systems currently using short-lived, difficult to recover balloons. These markets include weather balloons, remote sensing, and remote communication systems for commercial, civil, and military use, with flights numbering in the 10s of thousands per year. The TRL-USA balloon will improve capability, mission assurance, and reduce costs; making it a highly competitive option for these industries.

Management Team (cont.)

Principal Investigator:

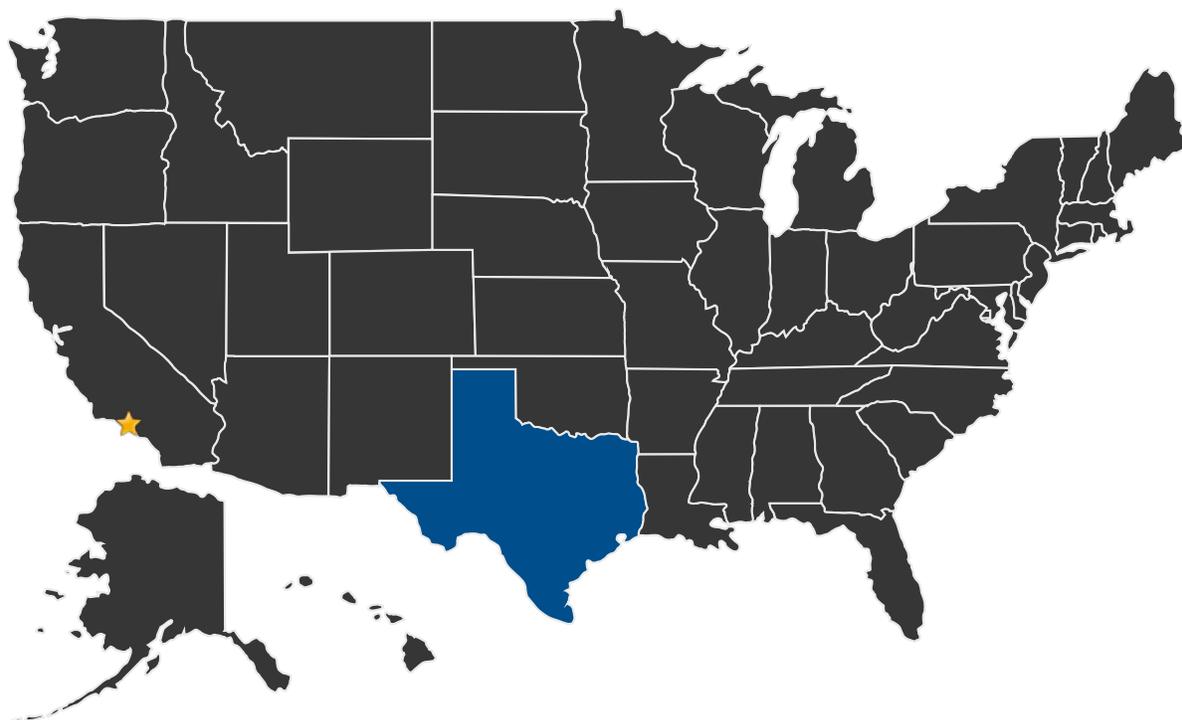
- Brian Aiken

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U.S. WORK LOCATIONS AND KEY PARTNERS



- U.S. States With Work ★ **Lead Center:**
Jet Propulsion Laboratory

Other Organizations Performing Work:

- Thin Red Line USA, dba of MKF Interests, LLC (Houston, TX)

PROJECT LIBRARY

Presentations

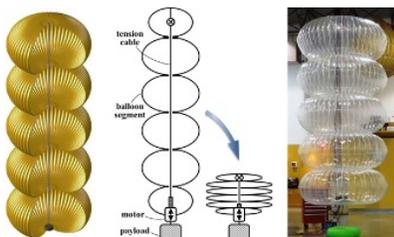
- Briefing Chart
 - (<http://techport.nasa.gov:80/file/23208>)

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IMAGE GALLERY



Adaptable Multi-Segment Altitude Control (AM-SAC) Balloon for Planetary Exploration, Phase I

DETAILS FOR TECHNOLOGY 1

Technology Title

Adaptable Multi-Segment Altitude Control (AM-SAC) Balloon for Planetary Exploration, Phase I

Potential Applications

The Thin Red Line USA proposed innovation enables NASA to conduct long duration atmospheric observations at both Venus and Titan with payloads >100kg with a new, low power, highly reliable, long life, lighter-than-atmosphere architecture that can be customized for multiple planetary missions with extensive non-recurring-engineering. The proposed balloon technology has immediate application in the exploration of atmospheric planets and moons. This technology improves upon the platform objectives of the Venus Climate Mission (VCM), one of five flagship missions called for by the National Research Council 2013 Decadal Survey. The VCM mission includes a gondola/balloon system with a 21 day life at a 55.5km altitude in 2021. Its objectives are to characterize the greenhouse atmosphere of Venus, its origin and evidence of climate change. This mission can be significantly enhanced by staying aloft for five or more years and navigate the planet utilizing altitude cycling. To meet a 2021 launch, preliminary design and technology completion for the VCM must occur in 2017-18 and can incorporate proposed innovation. The technology could also play a vital role in the Titan Saturn Mission which is expected to have a balloon-navigated sensor platform that operates in conjunction with an orbiter and lake-lander.